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REVERSE SMOKING and Its Oral Consequences in Caribbean and South American Peoples

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In a preliminary study of the reverse smoking habit and its effect on oral health, 21 subjects (19 women, 2 men) were examined thoroughly. Generally, the oral cavity had heavy tar deposits on the buccal and lingual surfaces of the teeth, tough, hard, leathery palate, reduced flow of saliva and leukoplakia on the palate and lips. Biopsy and cytology did not reveal dysplasia. The gingival health was average, sometimes excellent. Should reverse smoking cause palatal cancer, as has been stated, populations of reverse smokers should offer an exceptional opportunity for study of this form of oral cancer. If reverse smoking is exonerated, the role of tobacco tar and intense radiant heat as carcinogenic factors must be reappraised.

Recently, the Forsyth Dental Center initiated a program to study and evaluate the oral health of peoples indigenous to the South Caribbean. The area is an invaluable laboratory to study human growth and development. Causation factors may be isolated with respect to geneology, dietary habits, mode of living, customs and the effects of an increasing economic

Fig. 1 • Indian woman (patient 11) smoking in reverse manner



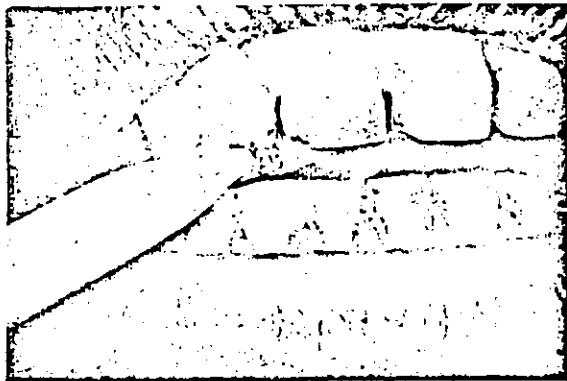


Fig. 2 • Close-up of same patient showing how cigarette is held by teeth

well-being. The population is nonmigratory and contains a number of ethnic groups. Although the groups are distinct and well-defined, customs and modes of living are similar at equivalent social strata.

The principal interest of this Forsyth study is the effect of a higher standard of living on growth and development and on oral health in particular. The introduction of European culture and the increase in wealth caused by modern technology have caused segments of this population to achieve standards of living equivalent to, or higher than, those of the United States. Other segments of the population have retained relatively primitive standards.

Reverse smoking is a specific custom peculiar to the lower economic groups of this region and occurs in similar groups in the warm temperature or tropical parts of the world. It is accomplished by holding the lighted end of a cigarette or cigar inside the oral cavity. Figure 1 shows a 49-year-old Indian smoking in this manner. Figure 2 is a close-up of the same smoker showing how the cigarette is held by the teeth. The smoke is inhaled little, if at all. Instead, the smoke and tar products are allowed to condense on the surfaces of the teeth and palate. Air is supplied to the burning zone through the unlighted end of the cigarette, and smoke

is expelled back through the cigarette or out through the mouth. Strangely enough, the custom occurs where the climate is equatorial.

Reverse smoking has been reported from Andhra in India;¹⁻⁹ from the Philippines among the pygmy Negritos of Bataan Peninsula¹⁰ and from Sardinia.¹¹⁻¹⁹ In the Americas, its distribution is not yet wholly known. It is prevalent in Jamaica, Venezuela, Colombia, Panama and some islands of the South Caribbean.²⁰⁻²⁵ In the Andhra district of India, this custom is referred to in Tamil as *Adda Poga*; in Sardinia as *Fogu a Intru*; in the Netherlands Antilles, those speaking Papiamentu call it *Huma pa den* and, in the Spanish-speaking regions of South America, it is called *Fumar para adentro*.

Although its origin is not understood, the custom is probably centuries old. The modern concept of cut tobacco placed in a thin container of paper probably was beyond the skill of the first people who smoked tobacco. It was easier to take a tobacco leaf, roll it, light it and place it inside the mouth.²² Since the custom perpetuates itself even in a modern society, it must be pleasurable, although many other explanations have been suggested. Shirokov reported it is practiced because of lack of money to buy cigarettes and desire to conceal the fact that one smokes. Contemporary reverse smokers (nearly all are women) rationalize the habit by the following explanations:

1. In household duties, such as cooking or washing, it is convenient to smoke in this reverse manner to keep the ashes from falling in food or on clothes, particularly when outdoors.
2. In strong winds, reverse smoking extends the burning time of the cigarette from two minutes to as long as 18 minutes and prevents ashes from being blown on one. In the Caribbean, trade winds of 15 knots are common.
3. In areas where disease-carrying insects are present, smoking acts as an insect repellent. In 1935, a severe epidemic of yellow fever caused public health officials

Table 1 • Oral health of reverse smokers, none of whom had complaints of illness

Patient no.	Sex	Age (yr.)	Previous visits to dentist	No. of cig./day	Av. no. yr. reverse smoking	Leukoplakia					Condition of tongue	Cytologic examination	Biopsy
						Chest roentgenogram	Hard palate	Soft palate	Buccal mucosa	lips			
1	F	40	None	6	25	Neg.*	Sev.†	Sev.	Mod.‡	Mod.	Scarred	Neg.	...
2	M	60	None	1	10	Neg.	Sl.§	Sl.	Sl.	None	Normal	Neg.	...
3	F	60	Several	6	45	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	Neg.
4	F	68	Several	6	53	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	Neg.
5	F	42	Several	20	15	Neg.	Mod.	Mod.	Mod.	Mod.	Scarred	Neg.	...
6	F	42	Several	10	20	Neg.	Mod.	Mod.	Mod.	Slight	Scarred	Neg.	...
7	F	38	None	10	20	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	Neg.
8	F	40	Several	6	20	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	Neg.
9	F	38	Several	20	23	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	Neg.
10	F	70	Several	14	55	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	Neg.
11	F	49	None	10	34	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...
12	F	78	Several	10	63	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...
13	F	68	Several	10	53	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...
14	F	78	Several	10	63	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...
15	F	68	Several	10	53	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...
16	F	68	Several	10	53	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...
17	F	78	Several	10	63	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...
18	M	70	Several	1	10	Neg.	Sl.	Sl.	Sl.	None	Normal	Neg.	...
19	F	38	Several	10	25	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...
20	F	60	Several	10	45	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	Neg.
21	F	70	Several	10	55	Neg.	Sev.	Sev.	Sev.	Mod.	Scarred	Neg.	...

*Neg., negative; †Sev., severe; ‡Mod., moderate; §Sl., slight.

in Maracaibo, Venezuela, to recommend reverse smoking as a means of repelling mosquitos.

Reverse smoking is peculiar and remote but it has been accused of causing palatal cancer.^{7, 13, 14, 22, 24, 26-29} If this assumption is true, the custom offers an exceptional opportunity to study the onset and early cytologic changes as well as the gross manifestations of carcinogenic dysplasia in several ethnic groups. If this assumption is not true, the role of tobacco tars and intense radiant heat as carcinogenic factors must be reappraised.³⁰⁻³²

LITERATURE REVIEW

Most of the published reports on reverse smoking attempt to relate it to carcinogenesis in tissues which may be exposed to heat, to unburned tobacco and paper or to the products of combustion. In a review of 235 male and 100 female cancer patients from coastal Andhra in India, Kini and Subba-Rao (1937) recorded carcinomas of the palate in 40 men and 12 women. All of the affected individuals gave a history of "smoking cigars with the lighted end inside the mouth—a peculiar habit particularly adopted both by the men and women of the poorer classes in this locality." Further similar observations from India were noted by Reddy and Rao,⁷ Kanadine³³ and Wahi.^{8, 9}

A comparable association between the reverse smoking of cigarettes and palatal carcinoma in Sardinia was suggested by Reddi,^{13, 16, 37} and Racugno.^{15, 16} Racugno implicated reverse smoking in 43 out of 46 cancers of the hard palate. These malignancies were chiefly seen in persons more than 60 years old who had reverse smoked for 15 to 40 years. Reddi^{13, 16, 37} discussed the probable progress of the palatal lesions from leukoplakia to invasive carcinomas of the cranial base and metastases to the cervical lymph nodes.

In the New World, Lepp and Wenger³⁴ reported that in Maracaibo, Venezuela, reverse smoking of cigars was a pre-Colombian practice among the Indians.

Table 2 • Dental health of reverse smokers

Patient No.	No. of teeth	Angle Class	Tooth vital.	Periodontal condition	Pocket formation	Alveolar bone loss	Facet wear	Caries	Calculus formation	Salivary flow	Periapical infection	Impacted teeth
1	13 upper, 14 lower	I	low	Av. for age	Sl.*	Mod.†	Sev.‡	Mod.	Mod.	Norm.‡	None	None
2	13 upper, 12 lower	I	Norm.	Poor	Sev.	Mod.	Sev.	Sev.	Sl.	Norm.	One cyst lower right third molar	...
3	None, no dentures	...	...	...	...	...	...	...	...	...	...	...
4	None, no dentures	...	...	...	...	...	...	...	...	...	...	...
5	Complete upper denture, 6 lower onclators	...	low	Poor	Sev.	Sl.	Mod.	None	Sev.	low	None	None
6	Complete upper denture, 6 lower	...	low	Norm.	Norm.	Norm.	Sev.	Arrested decay	Sev.	low	None	None

Today, with cigarettes, this habit is prevalent in the poorer Negro and Mestizo women but rare in the men. These authors noted a clearly feminine sex ratio of persons having palatal cancers: 104 women to 57 men. Reverse smoking in Venezuela also is mentioned by Jaffe.³⁸

In the district of Antioquia, Colombia, Correa³⁹ noted the prevalence of reverse smoking in women as opposed to men, and associated this habit with laryngeal cancer and occasional malignancies of the nasal mucosa.

New and Hallberg³⁹ and Martin⁴⁰ reported that palatal cancer is rare in the United States, and epidermoid carcinoma of the palate particularly so. In Panama, Shirokov²⁴ observed 13 women, chiefly from rural areas, with epidermoid carcinomas localized in the hard palate. All of these patients were reverse smokers of homemade cigars. Most of these lived in the rural interior of the country. In Panama, as in Colombia, Venezuela and the Southern Caribbean islands, this habit is largely confined to women.

INITIAL FIELD STUDY

The first step in ascertaining a possible connection between the reverse smoking custom and palatal cancer was a pilot study carried out in the South Caribbean islands in the summer of 1963. The specific aims of this pilot study were: (1) to ascertain the prevalence of reverse smoking by age and sex among the indigenous populations of the Netherlands Antilles, (2) to determine the feasibility of carrying out oral and physical examinations on a relatively large sample group and (3) to give complete physical and oral examinations to at least 21 natives who practiced reverse smoking.

The work of the pilot study began with visits to a number of hospital directors in the South Caribbean. The purpose of the study was explained to them, and their reactions were requested. Thus, preliminary assessments of the prevalence of reverse smoking in particular areas were

obtained. It was pointed out that it always would be feasible to carry out examinations on relatively large sample groups, but certain regions would be more convenient for studies of this kind and had better health records extending over longer periods.

The hospitals in the Netherlands Antilles were judged to be among the more desirable with respect to convenience and records. Discussions with the directors of two hospitals in the Netherlands Antilles resulted in the cooperation of their entire medical staffs and the eventual observation of over 200 reverse smokers. From these natives, almost entirely women, 21 were finally selected on the basis of proximity and willingness to cooperate.

All the physical and oral examinations were conducted in a dental clinic and hospital equipped with modern facilities. A social worker acted as interpreter and accompanied the investigators in the hospital and the patients' homes.

Cooperation was easily obtained in the hospital, where the investigators were accepted with friendly tolerance. Those patients first seen in their homes were apprehensive and reluctant to be examined. After the confidence of several patients in a community had been gained by careful explanation of the problem, other patients became friendly and cooperative. When their cooperation was obtained, the patients were brought to the hospital where they were given physical examinations. Roentgenograms of the chest were taken. Observations for abnormalities in the pharynx and lymphatic system were made. Pulse rate, body temperature and blood pressure were taken, and a stethoscopic examination of the heart was performed. The physical examinations were expected to reveal evidence of neoplasms of the pharynx, larynx and lymphatic system and evidence of lung and heart involvement.

After this, the patients were taken to the dental clinic where the oral records were taken. With a periodontal probe, two investigators carried out separate

7	15 upper, 13 lower	1	low	Exc. II	Norm.	Norm.	Slight	Sev.	Sev.	low	One cysl	None
8	12 upper, 14 lower	1	low	Norm.	Norm.	Norm.	Slight	Mod.	Sev.	low	None	None
9	9 upper, 13 lower		low	Exc.	Norm.	Norm.	Slight	None	Sev.	low	None	None
10	None in upper arch, no denture, 10 lower	1	low	Norm.	Norm.	Norm.	Sl.	Sl.	Sev.	low	None	None
11	14 upper, 14 lower	1	low	Exc. II	Norm.	Norm.	Sev.	Arrested decay	Sev.	low	None	None
12	None in upper arch, no denture, 6 lower	...	low	Norm.	Norm.	Norm.	Sev.	Arrested decay	Sev.	low	One cysl	None
13	None, no dentures	...	...	...	...	...	...	...	...	...	...	...
14	None, no dentures	...	...	...	...	...	...	...	...	...	...	...
15	None, no dentures	...	...	...	...	...	...	...	...	...	...	...
16	None, no dentures	...	...	...	...	...	...	...	...	...	...	...
17	None, no dentures	...	...	...	...	...	...	...	...	...	...	...
18	10 upper, 8 lower	1	Norm.	Poor	Sev.	Sev.	Sev.	Sev.	Mod.	Norm.	One cysl	None
19	15 upper, 11 lower	1	low	Norm.	Norm.	Norm.	Mod.	Arrested decay	Mod.	low	None	None
20	None, no dentures	...	...	...	...	...	...	...	...	...	...	...
21	None, no dentures	...	...	...	...	...	...	...	...	...	...	...

*Sl., slight. IMod., moderate. ISev., severe. INorm., normal. IExc., excellent.

examinations to determine the presence and extent of periodontal disease. Also independently they recorded presence, location, and degree of leukoplakia, scarring of tissue, carious lesions and tar deposits. Intraoral and extraoral photographs, both 35 mm. and Polacolor, were taken. Three separate study casts of the dental arches and of the tongue were made by means of alginate, reversible hydrocolloid and rubber base impression materials. Intraoral, full-mouth roentgenograms and lateral jaw roentgenograms were taken to determine alveolar bone loss. Vitality tests of the teeth were taken. Carious and abscessed teeth were removed where indicated and saved for sectioning. Three smears were taken from the hard palate: right, center and left. The position in which the patient held the cigarette was recorded. A throat stick was taken and scraped over the hard palate from posterior to anterior in alignment with the teeth. The residue was smeared on a plate and fixed with a dry fix spray material.⁴¹ Only one slide was made for each of the following areas: the soft palate, right and left buccal cheeks, tongue, upper and lower lips.

Finally, the patient was asked to rinse the mouth with normal saline solution and a Papanicolaou-type smear was made. The slides were all fixed and stained at the same time. Six of the 21 patients agreed to punch biopsies. In one, samples were taken from six separate parts of the oral cavity. The biopsy specimens were placed in 10 per cent Formalin and sent to Boston for sectioning and examination.

These oral examinations were expected to ascertain the presence of any oral dysplasia; the presence, degree and locations of leukoplakia, scarring of tissue, tar deposits, carious lesions, suppuration or inflammation of the gingiva; whether reverse smoking diminished the vitality of the teeth; whether the alveolar bone level was affected by the reverse smoking habit; the effects of reverse smoking on the enamel, dentin and pulpal chamber,

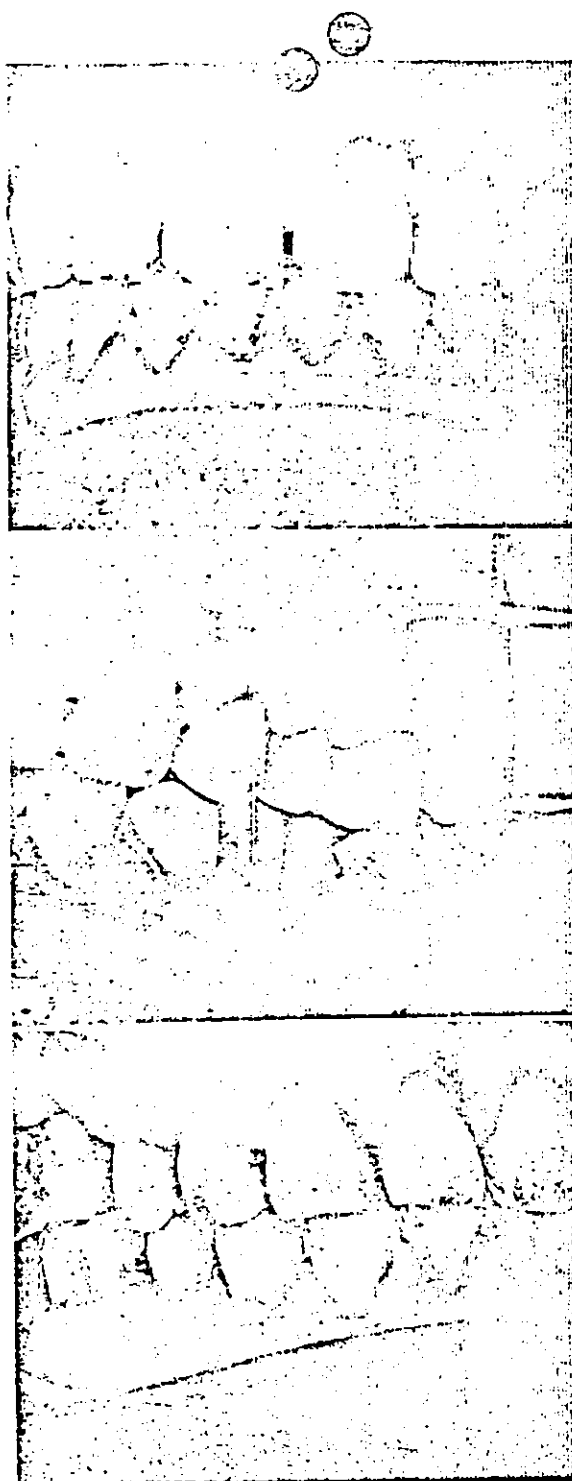


Fig. 3 • Intraoral views showing teeth of patient 11 in occlusion

and the effect of the reverse smoking habit on the natural level of radioactivity in the oral cavity.

RESULTS

More than 250 patients were briefly examined in this initial study. Initial examination consisted of a mouth mirror examination of the oral cavity, test for lymph node enlargement, test for mobility of teeth and palpation of the hard palate, soft palate, tongue and adjacent areas. All of these patients were reverse smokers who smoked from 1 to 20 cigarettes per day. All but two were women, and none showed malignant lesions, not even questionable regions. Twenty-one were selected for a more comprehensive examination.

Tables 1 and 2 summarize the data which were obtained on these 21 patients. Only 12 had teeth remaining at this examination. Leukoplakia were present in all, but its severity varied widely.

The tongue was scarred in all patients but two, both of whom were men who smoked only one cigarette each day. Cytologic smears were taken from nine sites in each patient. Findings were negative from all smears. Results from the three

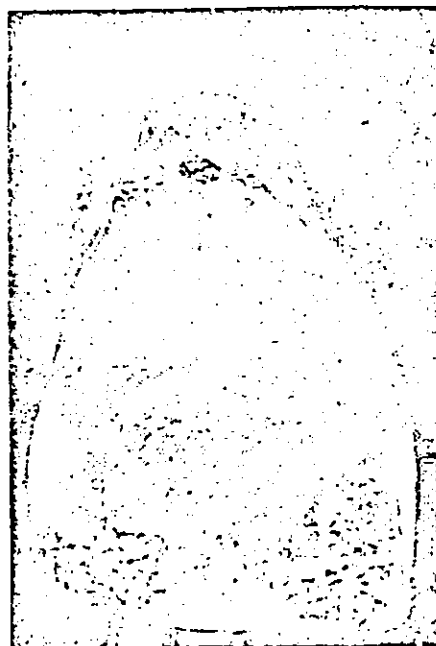


Fig. 4 • Closeup view of upper central incisor of patient 11. Note stripping of gingiva

biopsies from each of six patients also were negative.

In Table 2 the dental health of 21 patients is summarized. The tooth vitality

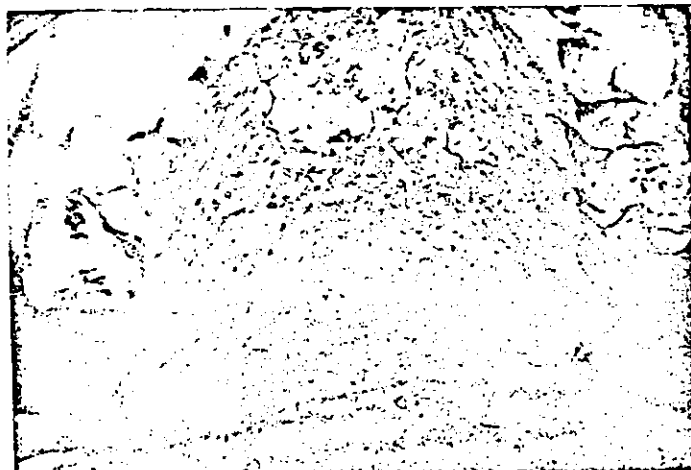


Fig. 5 • Palate of patient 11. Dark regions are burned; note dark staining of teeth

was low for all patients except the two men. The periodontal condition varied from poor to excellent with the majority having normal condition. Bone loss was average, and decay was generally moderate; four had arrested decay. Calculus formation was severe, and salivary flow was in general low. The general exceptions are the two men who smoked only one cigarette per day.

The oral condition of patient 11 was typical of a Netherlands Antilles reverse smoker with a nearly full complement of teeth.

Patient 11 (Fig. 1, 2) was a 49-year-old American Indian who has smoked ten cigarettes in the reverse manner each day for 34 years. She had never received dental care. Figure 3 shows three intraoral views of her teeth in occlusion, and Figure 4 is a close-up of the upper palate. The condition of the gingiva was excellent. Separate periodontal examinations by two investigators revealed absence of periodontal infection with normal pocket depths. Slight marginal inflammation was noticed in the regions immediately adjacent to the tar deposits, but there was complete absence of suppuration. Most important, the investigators were impressed with the remarkably healthy stippling of the gingiva.

Leukoplakia was observed on the lips where the cigarette was held. It was also observed on the hard and soft palate and on the occlusal ridges of the buccal surfaces of the oral vestibule. There was scarring of the hard palate, especially in the anterior third, with dark brown patches, and there were (Fig. 5) heavy black tar deposits on the palatal surfaces of the teeth from cuspid to molar. Similar deposits were found on the palatal and lingual surfaces of all the teeth as well as the buccal surfaces of the mandibular arches. They were not present in the self-cleaning areas of the teeth. The tar deposits were especially heavy on the palatal surfaces near where the burning tip of the cigarette would be. The mesial surfaces of the teeth near the burning zone

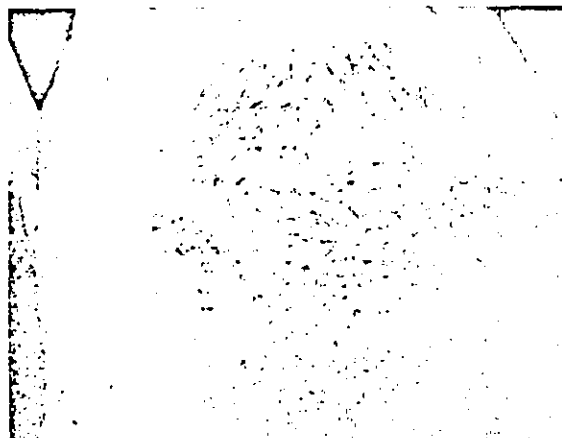
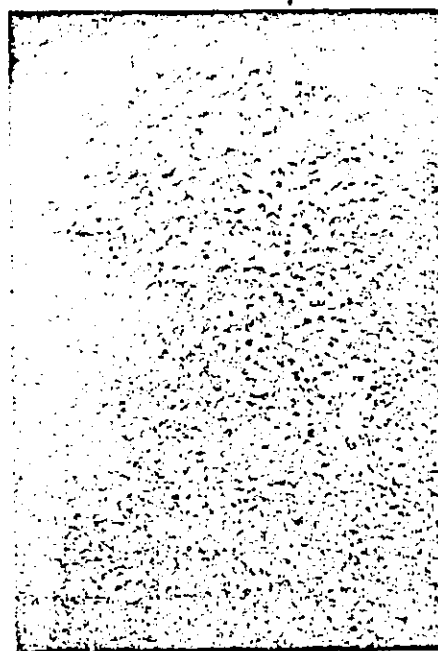


Fig. 6 • Brown hairy tongue of patient 11

received heavy deposits, but the distal surfaces were relatively clean. Patient 11 never used a tooth brush, but has removed unsightly tar deposits with the head of a

Fig. 7 • Closeup view of burned region of patient 11's tongue



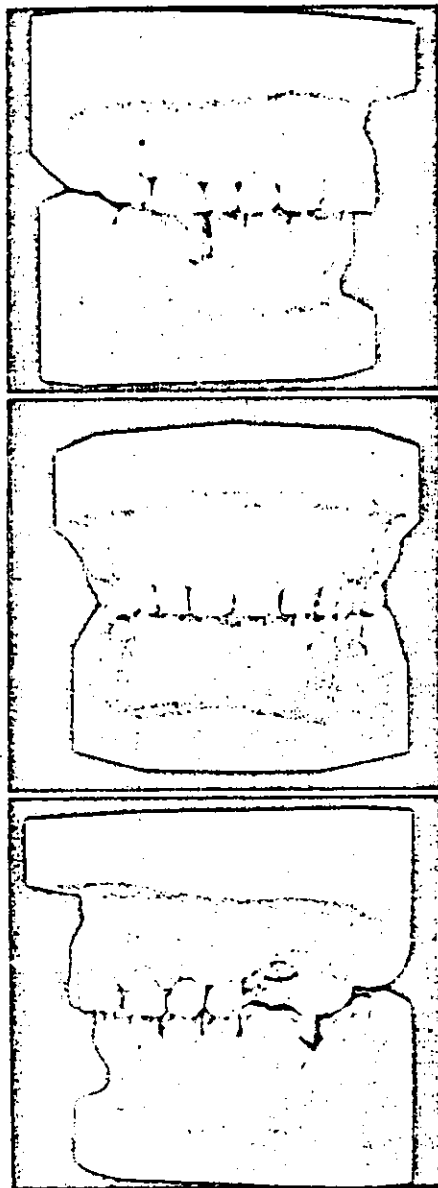


Fig. 8 • Study models of patient 11. Note attrition and facet wear

pin. Any additional cleaning was caused by the tongue, cheeks and saliva.

Her palate was tough, hard and leathery. There was a dryness in the mouth and a reduced flow of saliva. This was

evidenced by a parched, cracked texture of the tissues in the oral cavity. Her tongue was brown, hairy and dry and had several cracks and fissures (Fig. 6). It had several burns (Fig. 7).

There was evidence of arrested decay, but the general decay rate of the teeth was low. She and other patients reported a high rate of decay during early teens, which stopped after the commencement of the reverse smoking habit.

Study casts showed location, degree and severity of leukoplakia, scarring of tissue, tar deposits, erosion and facet wear (Fig. 8). Vitality test revealed pronounced reduction in sensitivity to an electric pulp tester.

Full-mouth roentgenograms were made (Fig. 9). The high bone level can be observed. Bone loss is minimal or nonexistent even in regions where there is pocket formation, for example, the mesial margin of the tipped lower left second molar, and subsequent bone loss would be expected. Since she had no periapical infection, patient 11 did not require any extractions.

Smears were taken from the hard and soft palates for cytologic examination, and one smear was made with the solids centrifuged from an oral rinse (Papanicolaou-type smear). The results of examination of these smears were the following:

From the hard palate, center, the smear was leukopenic and had numerous hyperkeratotic squamous cells indicative of leukoplakia. Occasional cornified squamous cells with slightly enlarged benign nuclei were seen.

From the hard palate, right, cornified (pyknotic nuclei) squamous cells predominated in the smear. There were occasional hyperkeratotic squamous cells, one or two groups of precornified cells with vesicular nuclei and no evidence of dysplasia.

In the smear from the hard palate, right, there were polymorphonuclear leukocytes and lymphocytes, squamous cells of cornified and precornified types and no evidence of leukoplakia.

The smear from the soft palate (center, right and left), lips and buccal mucosa contained squamous cells predominantly of precornified and immature intermediate types with normal vesicular nuclei and cornified squamous cells of moderate number. There was no hyperkeratosis to suggest leukoplakia.

Examination of the smear from the residue of the oral rinse (Papanicolaou-type smear) revealed polymorphonuclear leukocytes, bacteria and nucleated squamous cells of cornified and precornified types. There was no evidence of leukoplakia.

No biopsies were taken from patient 11.

The changes in the reverse smoking syndrome caused by ethnic differences are illustrated by patient 7, a Bush Negro from one of the adjacent islands.

She was 38 years old and had smoked at least ten cigarettes per day in the reverse manner for 20 years. Patient 7 smoked in a different manner than patient 11 in that she held the tip of the cigarette close to her tongue, as shown in Figure 10. Patient 7 also had received no dental care.

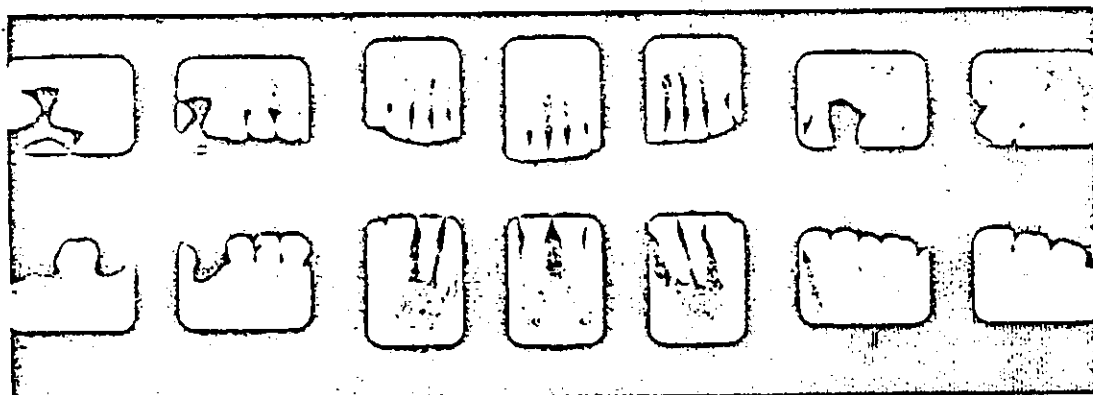
Figure 11 illustrates three intraoral views in occlusion of patient 7. Again, the condition of the gingiva was excellent; pocket depths were normal, and inflammation was limited to that region immedi-

ately adjacent to the tar and stain deposits. Figure 12 is a closeup view of the anterior region of the mouth, where the gingiva was dry, shiny and stippled. Figure 13, below, shows the lingual aspect of the mandibular arch; Figure 13, right, the heavy piling up of the tar on the side opposite the one where the cigarette was held. Leukoplakia of the lips and palatal surfaces, scarring of the hard palate and tar deposits were similar to those in patient 11.

Patient 7 differed from patient 11 in several ways. The palate (Fig. 14) was even harder, more leathery and tougher than that of patient 11. All the surface appeared to have been burned. The buccal mucosa was also tougher and more leathery. The decay rate was severe and, in several places, periapical infection was present.

Cytologic data were essentially the same as for patient 11. In addition, several biopsies were taken from patient 7, in which were found hyperkeratosis characterized by a thick, well-formed, homogeneous stratum corneum. There were varying degrees of acanthosis and scattered regions of dyskeratosis, although the dyskeratosis did not appear to be a characteristic aspect of the lesion. Chronic inflammatory infiltration of the underlying connective tissue was present but mini-

Fig. 9 • Full-mouth roentgenograms of patient 11. Note high bone level and absence of apical infection



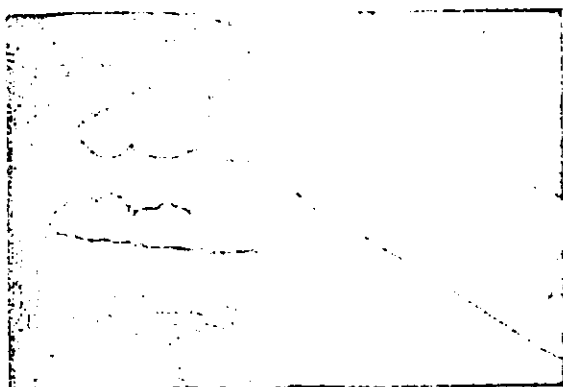


Fig. 10 • Patient 7, a Bush Negro, who had smoked in reverse manner for more than 20 years

mal. Mucous glands of the hard palate showed acinar distension and ductal dilatation. These lesions fit the general category of leukoplakia. The hyperkeratinization was notable, but dyskeratotic changes were minimal and chronic inflammation was unusually minor in relation to the significant hyperkeratosis.

Despite all patients' being urged to discontinue reverse smoking, patient 7 was the only one who stopped. In the past, government officials have had little success in persuading women to discontinue this practice. After three weeks of non-smoking, the condition of the palate of patient 7 was improved greatly. After three months, there was almost a normal palate; however, the health of the gingiva declined during this period and regions of decay, which previously had not disturbed the patient, started to become more sensitive. At the end of the three months, there was some suppuration and pocket formation.

The head of the dermatology department of San Pedro Hospital reported that after treatment of a reverse smoker for three weeks with Kenacort in Orabase on the palate and 50,000 units of vitamin A given three times a day, the palate returned to its normal condition.

The epithelium of the palates of the other reverse smokers examined resembled that seen in patients 11 and 7.

DISCUSSION

Epidermoid cancer of the hard palate is extremely rare in the United States. Martin⁴⁰ reported that the records of the Memorial Hospital of New York for the treatment of cancer and other diseases reveal that malignant tumors of the palate make up 8 per cent of all oral cancer and about 2 per cent of all human cancer. He reported that from 1907 to 1938 only 25, or 0.5 per cent, of 5,000 malignant tumors of the oral cavity were palatal cancers and that 90 per cent of these cancers were found in the male.

In Curacao, Eiberger⁴² reported the percentage of deaths from neoplasms consistently rose from 11.3 per cent to 21.07 per cent from January, 1936 to January, 1960. Of the total of 3,937 patients who died from all causes and on whom autopsies were performed, malignant neoplasms were found in 531. Of these 531 deaths from malignant neoplasms, only 2.5 per cent were caused by oral cancer. Two deaths from palatal cancer were found, or 0.4 per cent of the aggregate of deaths from malignant neoplasms; these figures agree with those of Martin.⁴⁰

In Panama, where there is reported to be a large female reverse smoking population, Shirokov²⁴ reported that 22 of 55 cancers of the oral cavity seen in one year were epidermoid cancers of the hard palate. All of these were found in women.

If Eiberger's figures are applied to the data of Shirokov, one would expect to find only nine cases of palatal cancer in the 55 reported by that author; 22 represents a significant increase.

It also was noticed that in the United States, where reverse smoking does not exist, 90 per cent of the epidermoid cancers are found in the male, whereas in Panama, where reverse smoking is prevalent, all the epidermoid cancers were found in women.

The statistical chance of finding a palatal cancer in Aruba-Curacao region is small. One would expect to find, in 10,000 reverse smokers, three cases of epi-

dermoid cancer of the hard palate in 15 years. In Panama, Shirokov²⁴ reported 22 cases of epidermoid cancer of the hard palate of a total of 593 cases of cancer. This represents 3.7 per cent of the total number of cases of cancer. Thus, the frequency of cancer of the hard palate is nine times greater in Panama than in the United States or in the Netherlands Antilles. We then would expect to see palatal cancer in almost three of 1,000 reverse smokers who have smoked 15 years, based on Shirokov's figures. There is a question why the figures in the Netherlands Antilles are no different than those of the United States. Many clinical observers including Shirokov in Panama, Reddy in India and Redi in Sardinia, have attributed epidermoid cancer of the palate to reverse smoking. The data from the Netherlands Antilles does not support this assumption.

Numerous studies are in progress for the purpose of evaluating the effects of tobacco and smoking on the respiratory tissues. Results to date suggest some linkage of respiratory disease to smoking. Statistical evidence is such as to warrant a vast amount of current research.

How does this apply to the oral problems encountered in the reverse smoker? The answer lies in the fact that the squamous epithelium is being exposed to the same agents: tobacco tar, nicotine, smoke and heat. With reverse smoking, however, the heat is more direct, resulting in hyperkeratinization of directly affected areas and increased leukocytosis of adjacent areas. Such changes are typical of inflammatory response to injury. These changes were observed in an initial cytologic study of the Aruban Indian reverse smoker. Records of patients with a history of prolonged exposure to this method of smoking indicate a high incidence of oral lesions.

Microscopically, the majority of the cytologic smears revealed the typical cells of leukoplakia. These cells are characterized by loss of nucleus and by staining properties. The hyperkeratotic cells stain

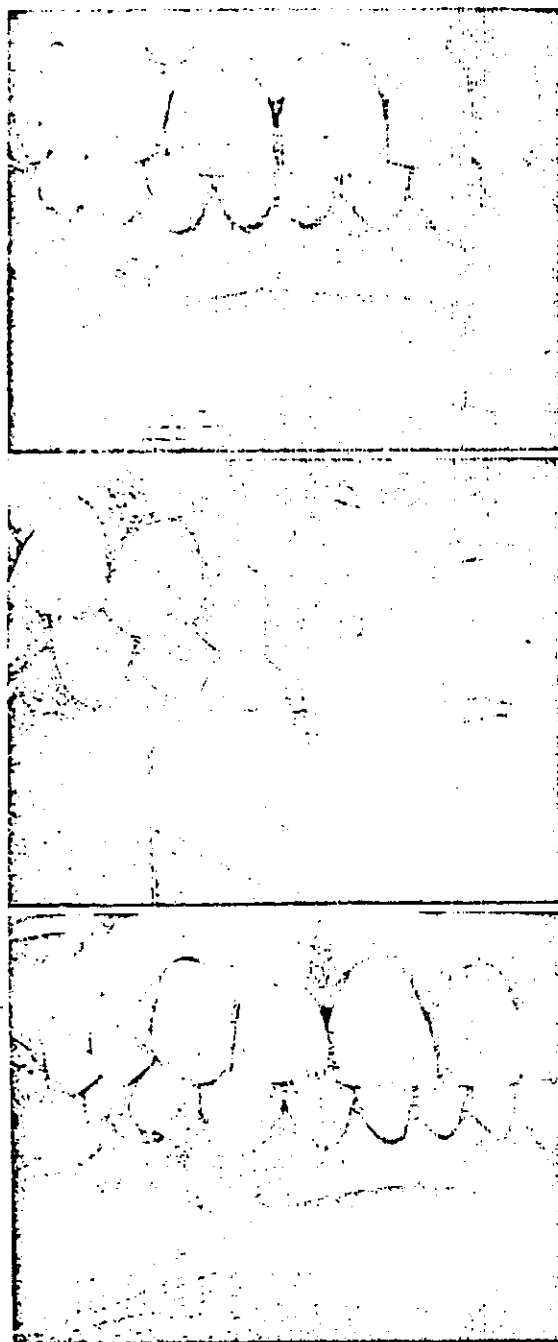


Fig. 11 • Intraoral views of teeth in occlusion of patient 7

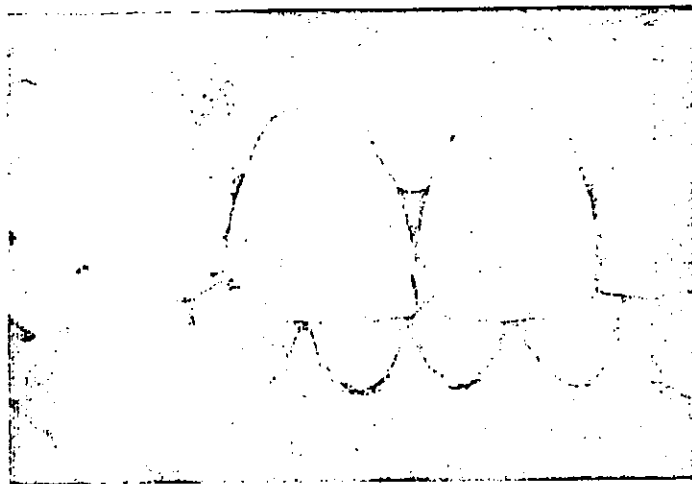


Fig. 12 • Closeup view of anterior region of mouth of patient 7. Note dry shiny gingiva

yellow to mauve, unlike the pink and blue of normal squamous epithelial cells. The smears had an abundance of leukocytes, predominantly lymphocytes, scattered throughout. The amount of normal acidophilic cornified squamous cells was decreased or absent in most patients with severe cases. This supports the findings of Ayre,⁴³ whose study demonstrated that the degree of cornification is inversely proportional to the number of cigarettes smoked daily.

From these results, we can conclude that the heat and volatile tars produced by this type of smoking cause the superficial squamous cells to undergo hypercornification. For this reason, leukoplakic cells and basophilic precornified elements are present. The acidophilic cornified cells, being transformed to hyperkeratotic cells, are eliminated. If the patient stops smoking, a normal maturation of the squamous epithelium takes place with the emergence of the acidophilic cornified squamous elements. Along with normal maturation, there is a decrease in the leukocytic population because of the regression of the inflammatory status of the epithelium.

In one smear, cellular atypia was evidenced by a squamous cell with a rather enlarged hyperchromic nucleus. The

staining of the nucleus was even, and no chromatin clumping was evident. This dyskaryosis is similar to that in cervical cytology described by Ayre.

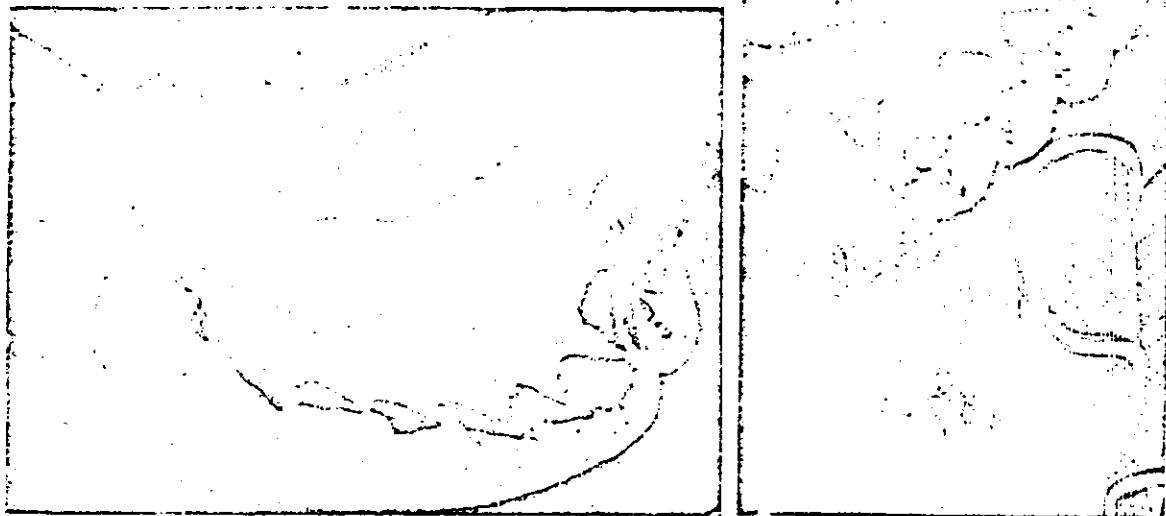
The average gingival condition of most of the reverse smokers and the excellent condition of a few is not understood and invites further investigation. This excellent state of oral health occurred in the presence of numerous burns of the palate and tongue and with exceptionally high deposits of calculus and tar products.

Medical research has demonstrated the correlation between epidermoid cancers of the hard palate and certain ethnic groups. The low incidence of epidermoid cancer of the hard palate in the Netherlands Antilles, despite the prevalence of reverse smoking, may result from a factor of ethnic background (70 per cent Negro).

SUMMARY

As part of a program to evaluate oral health in the South American and South Caribbean areas, a preliminary study of the reverse smoking habit and its effect on oral health has been completed. In reverse smoking, the lighted end of the cigarette is placed within the oral cavity.

Fig. 13 • Below: Lingual aspect of mandibular arch of patient 7.
Right: Palatal aspect of maxillary arch of patient 7. Note heavy
piling up of tar on side opposite to where cigarette was held



Air is supplied to the burning zone through the unlighted end of the cigarette, and smoke is expelled back through the cigarette or through the mouth.

From 250 reverse smokers given an oral examination, 21 (19 women, 2 men) were selected to be examined thoroughly.

Generally, the oral cavity had heavy tar deposits on buccal and lingual surfaces

of the teeth; tough, hard, leathery palate and a reduced flow of saliva, and leukoplakia on the palate and lips. Biopsy and cytology did not reveal dysplasia. The health of the gingiva was average and sometimes excellent.

Although this custom of reverse smoking is peculiar and remote, it is of interest since it is accused of causing palatal can-



Fig. 14 • Palate of patient 7. Palate was hard, tough and leathery

cer. If this assumption is true, the custom offers an exceptional opportunity to study the onset and early cytology as well as the gross manifestations of carcinogenic dysplasia in several ethnic groups. If this assumption is not true, the role of tobacco tar and intense radiant heat as carcinogenic factors must be reappraised.

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